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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/024,208	12/21/2001	David J. Cooperberg	015290-546	9076

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Peter K. Skiff
BURNS, DOANE, SWECKER & MATHIS, L.L.P.
P.O. Box 1404
Alexandria, VA 22313-1404

EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT PAPER NUMBER

1763

DATE MAILED: 04/08/2003 //

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/024,208

Applicant(s)

COOPERBERG ET AL.

Examiner

Luz L. Alejandro

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 24 January 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 4-line 2, the phrase "on-axis outlet in an axial end surface of the gas injector" in line 2 is unclear because the relationship between the on-axis outlet and the axial end surface is not understood.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-4, 6, 8, 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Fujii et al., U.S. Patent 4,980,204.

Ni et al. shows the invention substantially as claimed including a plasma processing system used for etching or CVD comprising: a plasma processing chamber 10; a vacuum pump connected to outlet 15 of the processing chamber; a substrate support 12 on which a substrate 13 is processed within the processing chamber; a dielectric member 20 having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber; a gas injector 22 extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber and injecting the process gas toward a primary plasma generation zone (see, for instance, Fig. 3A); and an RF energy source 18 comprising an RF antenna in the shape of a planar or non-planar spiral coil which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate (see fig. 1 and page 9, line 8 to page 10, line 25). Furthermore, note that Ni et al. discloses that the gas injector structure is removably mounted in the dielectric window and is secured by a vacuum seal between the gas injector and the dielectric window (see page 13-line 20 to page 14-line 2)

Ni et al. fails to expressly disclose a gas injector including a plurality of gas outlets supplying gas at flow rates that are independently varied and wherein the gas outlets are supplied process gas by a single gas supply. Fujii et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets 111,112,113,114 that are independently connected to a single gas supply line through gas flow control valves 13,14,15,16 which provide independent flow rate control (see Figs. 3-8 and col. 4-line 23 to col. 8-line 12, especially figs. 7a, 7b and 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. by replacing the gas injector structure with the gas injector structure of Fujii et al. because this will provide independent flow control for each of the outlets of the injector, therefore allowing improved controllability and uniformity of the substrate processing being conducted within the chamber. As stated above, Fujii et al. discloses the use of a single gas supply line. Furthermore, it would have been an obvious choice of design to one having ordinary skill in the art at the time the invention was made to have a single gas supply line connected to independent gas outlets if the same gas or mix of gases is intended to be supplied to the apparatus through all the independent gas outlets.

With respect to claim 4, it should be noted that, as broadly claimed, Fujii et al. discloses the on-axis and the off-axis outlets, with respect to an axis perpendicular to the substrate surface.

Claims 5, 7, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-4, 6, 8, and 10-14 above, and further in view of Ishihara et al., U.S. Patent 5,160,543.

Ni et al. and Fujii et al. are applied as above but do not expressly disclose the claimed gas outlets limitations. Ishihara et al. discloses an apparatus comprising a gas injector having a center gas outlet 209 extending in an axial direction perpendicular to the exposed surface of the substrate and a plurality of angled gas outlets 210 extending at an acute angle to the axial direction (see fig. 2 and its description). Also note that the gas injector has a conical side surface having the off-axis outlets therein. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. modified by Fujii et al. as to comprise the gas injector configuration taught by Ishihara et al. in order to efficiently introduce the gas(es) into the chamber and towards the substrate surface.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-4, 6, 8, and 10-14 above, and further in view of Powell et al., U.S. Patent 6,287,643.

Ni et al. and Fujii et al. are applied as above but do not expressly disclose wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector. Powell et al. discloses a gas injection tube 84 provided with an electrically conducting shield (see col.

9, lines 33-50) that minimizes plasma ignition until the gas reaches the main chamber (see Fig. 5 and col. 7-line 57 to col. 9-line 50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the injector of the apparatus of Ni et al. modified by Fujii et al. with an electrically conducting shield so as to minimize plasma ignition within the injector because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Claims 1-4, 6, 8, 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Yamazaki et al., U.S. Patent 4,105,810 and further in view of Fujii et al., U.S. Patent 4,980,204.

Ni et al. shows the invention substantially as claimed including a plasma processing system used for etching or CVD comprising: a plasma processing chamber 10; a vacuum pump connected to outlet 15 of the processing chamber; a substrate support 12 on which a substrate 13 is processed within the processing chamber; a dielectric member 20 having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber; a gas injector 22 extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber and injecting the process gas toward a primary plasma generation zone (see, for instance, Fig. 3A); and an RF energy source 18 comprising an RF antenna in the shape of a planar or non-planar spiral coil which

inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate (see fig. 1 and page 9, line 8 to page 10, line 25). Furthermore, note that Ni et al. discloses that the gas injector structure is removably mounted in the dielectric window and is secured by a vacuum seal between the gas injector and the dielectric window (see page 13-line 20 to page 14-line 2)

Ni et al. fails to expressly disclose a gas injector including a plurality of gas outlets supplying gas independently and wherein the gas outlets are supplied process gas by a single gas supply. Yamazaki et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets that are independently connected to a single gas supply line (see Figs. 1 and 3a and their description). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. by replacing the gas injector structure with the gas injector structure of Yamazaki et al. since it is a suitable structure for introducing gases into the chamber. As stated above, Yamazaki et al. discloses the use of a single gas supply line and as broadly claimed the on-axis and the off-axis outlets. Also, it would have been an obvious choice of design to one having ordinary skill in the art at the time the invention was made to have a single gas supply line connected to independent gas outlets if the same gas or mix of gases is intended to be supplied to the apparatus through all the independent gas outlets.

Ni et al. and Yamazaki et al. do not expressly disclose that the plurality of gas outlets are independently connected to the single gas supply through gas flow control

valves to independently control the gas flow rates. Fujii et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets 111,112,113,114 that are independently connected to a single gas supply line through gas flow control valves 13,14,15,16 which provide independent flow rate control (see Figs. 3-8 and col. 4-line 23 to col. 8-line 12, especially figs. 7a, 7b and 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. modified by Yamazaki et al. to further comprise the gas flow controllers of Fujii et al. because this will provide independent flow control for each of the outlets of the injector, thereby allowing improved controllability and uniformity of the substrate processing being conducted within the chamber.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Yamazaki et al., U.S. Patent 4,105,810 and Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-4, 6, 8, and 10-14 above, and further in view of Powell et al., U.S. Patent 6,287,643.

Ni et al., Yamazaki et al. and Fujii et al. are applied as above but do not expressly disclose wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector. Powell et al. discloses a gas injection tube 84 provided with an electrically conducting shield (see col. 9, lines 33-50) that minimizes plasma ignition until the gas reaches the main chamber (see Fig. 5 and col. 7-line 57 to col. 9-line 50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time

the invention was made to provide the injector of the apparatus of Ni et al. modified by Yamazaki et al. and Fujii et al. with an electrically conducting shield so as to minimize plasma ignition within the injector because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Claims 1-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Ishihara et al., U.S. Patent 5,160,543 and further in view of Fujii et al., U.S. Patent 4,980,204.

Ni et al. shows the invention substantially as claimed including a plasma processing system used for etching or CVD comprising: a plasma processing chamber 10; a vacuum pump connected to outlet 15 of the processing chamber; a substrate support 12 on which a substrate 13 is processed within the processing chamber; a dielectric member 20 having an interior surface facing the substrate support, wherein the dielectric member forms a wall of the processing chamber; a gas injector 22 extending through the dielectric member such that a distal end of the gas injector is exposed within the processing chamber and injecting the process gas toward a primary plasma generation zone (see, for instance, Fig. 3A); and an RF energy source 18 comprising an RF antenna in the shape of a planar or non-planar spiral coil which inductively couples RF energy through the dielectric member and into the chamber to energize the process gas into a plasma state to process the substrate (see fig. 1 and page 9, line 8 to page 10, line 25). Furthermore, note that Ni et al. discloses that the

gas injector structure is removably mounted in the dielectric window and is secured by a vacuum seal between the gas injector and the dielectric window (see page 13-line 20 to page 14-line 2)

Ni et al. fails to expressly disclose a gas injector including a plurality of gas outlets supplying gas independently and wherein the gas outlets are supplied process gas by a single gas supply. Ishihara et al. discloses an apparatus comprising a gas injector having a center gas outlet 209 extending in an axial direction perpendicular to the exposed surface of the substrate and a plurality of angled gas outlets 210 extending at an acute angle to the axial direction (see Fig. 2 and its description). Also note that the gas injector has a conical side surface having the off-axis outlets therein. In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of Ni et al. by replacing the gas injector structure with the gas injector structure of Ishihara et al. in order to efficiently introduce the gas(es) into the chamber and towards the substrate surface.

Ni et al. and Ishihara et al. do not expressly disclose that the plurality of gas outlets are independently connected to a single gas supply through gas flow control valves to independently control the gas flow rates. Fujii et al. discloses an apparatus comprising a gas injector having a plurality of gas outlets 111,112,113,114 that are independently connected to a single gas supply line through gas flow control valves 13,14,15,16 which provide independent flow rate control (see Figs. 3-8 and col. 4-line 23 to col. 8-line 12, especially figs. 7a, 7b and 8). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made

to modify the apparatus of Ni et al. modified by Ishihara et al. to further comprise the gas flow controllers of Fujii et al. because this will provide independent flow control for each of the outlets of the injector, thereby allowing improved controllability and uniformity of the substrate processing being conducted within the chamber. Also, as stated above, Fujii et al. discloses the use of a single gas supply line. Furthermore, it would have been an obvious choice of design to one having ordinary skill in the art at the time the invention was made to have a single gas supply line connected to independent gas outlets if the same gas or mix of gases is intended to be supplied to the apparatus through all the independent gas outlets.

Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ni et al., WO 00/41212 in view of Ishihara et al., U.S. Patent 5,160,543, and further in view of Fujii et al., U.S. Patent 4,980,204 as applied to claims 1-14 above, and further in view of Powell et al., U.S. Patent 6,287,643.

Ni et al., Ishihara et al. and Fujii et al. are applied as above but fail to expressly disclose wherein the gas injector is further provided with an electrically conducting shield which minimizes plasma ignition within gas passages located in the gas injector. Powell et al. discloses a gas injection tube 84 provided with an electrically conducting shield (see col. 9, lines 33-50) that minimizes plasma ignition until the gas reaches the main chamber (see Fig. 5 and col. 7-line 57 to col. 9-line 50). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the injector of the apparatus of Ni et al. modified by Ishihara et al.

and Fujii et al. with an electrically conducting shield so as to minimize plasma ignition within the injector because plasma ignition within the injector can result in detrimental effects such as damage to the injector as well as uniformity problems with processing within the chamber.

Response to Arguments

Applicant's arguments with respect to claims 1-15 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 703-305-4545. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

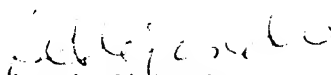
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory L. Mills can be reached on 703-308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Application/Control Number: 10/024,208

Page 13

Art Unit: 1763

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.


Luz L. Alejandro
Primary Examiner
Art Unit 1763

April 7, 2003